

# 4

## Tracking Using GPS Technology

### What this chapter will cover:

- The development of GPS technology and its application to tourist tracking research.
- The possibility for applying this technique in a range of different tourism contexts.
- The detailed spatio-temporal findings regarding tourists' mobility, that have emerged from this technique.
- The challenges that GPS technology faces in terms of its limited application, battery life and requirement for outdoor environments.
- The considerations that researchers must take to use GPS research in an ethical manner.

### Introduction

The use of global positioning system (GPS) technology underpins many different methods of tracking. GPS tracking involves the use of a beacon that sends the location of a device to satellites to determine the precise location of the beacon. In recent years, technological improvements have meant that GPS tracking units have become exponentially smaller in size. Whereas early portable beacons such as the Magellan (launched in 1989) were 22 cm in length and around 700 grams in

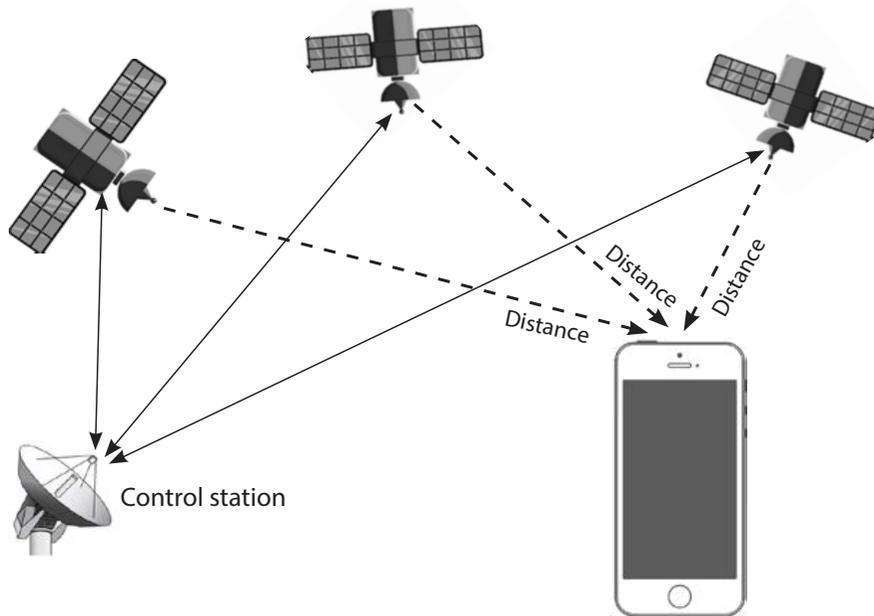
weight, if not larger than television screens, they can now fit into the back of watches and mobile phones (Shoval and Isaacson, 2010). This chapter will explore the development of GPS technology and its application to tourism research, when utilised with portable GPS loggers.

## Development of GPS technology

The desire to determine where humans are positioned relative to others and other objects is ancient, and dates back many millennia. This is evidenced through humans' alignment of buildings such as Stonehenge and the Pyramids relative to celestial constellations (Shoval and Isaacson, 2010; Hofmann-Wellenhoff, Lichtenegger and Collins, 2001). The development of GPS technology could be regarded as a modern extension of this desire. The technology involves a constellation of satellites that communicate with a device on the earth in order to triangulate the position of the device and deliver information on location and time (McKercher and Lau, 2009). The term Global Navigation Satellite Systems (GNSS) refers to these systems. GPS is one of these and was developed by the United States of America. Other systems include the Russian Global Navigation Satellite System (GLONASS), the Chinese BeiDou Navigation Satellite System and the European Union's Galileo system. Despite GNSS being the more accurate term, GPS technology is more commonly used as a generic term that refers to all systems, therefore will be used in this chapter.

GPS technology had its genesis in the 1950s and 1960s, following the launch of the first artificial earth satellite, Sputnik, in 1957. Sputnik led to the development of technology that could instantaneously determine precise locations anywhere in the world. Following this, in 1965, TRANSIT systems were developed by the United States military to assist submarines with navigation. TRANSIT used six satellites that orbited at 1100km altitude and allowed for the determination of the exact location of vessels and aircraft. However, the system was limited in its accuracy and ability to provide a continual position. Consequently, in the early 1970s, GPS was developed by the military to overcome these limitations, before being made available to civilians

in the early 1980s (Shoval and Isaacson, 2010; Hofmann-Wellenhoff, Lichtenegger and Collins, 2001).



**Figure 4.1:** How GPS systems work. A network of control stations makes sure that satellites are always where they are supposed to be. The phone picks up signals from the satellites and calculates the distance from their known positions. As long as at least three satellites' signals can be picked up, the phone can calculate its position to within a few metres.

Today, GPS technology is embedded in many different devices. For the purposes of tourist tracking research, the most significant of these are GPS loggers and data pushers/GPS beacons. GPS loggers are made up of several components including a beacon, that transmits a signal to satellites and a logger that stores coordinate information at regular intervals inside the device. These coordinates can then be transferred via a memory card or USB port to a computer for analysis.

Data pushers/GPS beacons are used to track movement in real time. These devices push or send a signal with location details, at regular intervals, to a server where data can be stored and analysed immediately. Data pushers come in a range of formats from stand-alone tracking devices attached to rental cars or company assets (such as animals or aircraft), through to smart watches and mobile phones.